chæte fauna of this country. A few local names are in use, such as dew-worm, brandling, lob-worm, and cockspur, but these are as valueless for scientific purposes as cuckoo-flower or bachelor's buttons would be to a botanist.

It will be some time before my volume on British earthworms is published by the Ray Society. In the meantime, will not some publisher undertake to issue a small popular handbook of British worms, with illustrations, at a shilling? We have about fifty earthworms in this country, but only a dozen or so are by any means common, and it would be very easy for our working naturalists to get a grip of the subject, and thereby render immense service to a branch of science which is of the utmost practical value. Though I have written a large number of articles on our Annelids during the past thirty years, there is nothing on the subject which is available in a popular and handy form for would-be students, and in this matter such a handbook is sadly overdue.

May I venture once more to appeal to readers of NATURE for specimens of luminous worms or other creatures, as well as for rare, unusual, or abnormal forms, that would merit attention in my Ray Society monograph?
HILDERIC FRIEND.

Cathay, Solihull, November 6.

The Doubly Refracting Structure of Silica Glass.

IN an interesting letter on the above subject in NATURE of October 23 Lord Rayleigh mentions that, when used with accurately crossed Nicols, "a circular disc of optical quality silica showed a spiral structure." Upon reading this letter I was reminded of a very interesting colour effect I saw several years ago in fused quartz which had been acted on by the rays from radium. As is well known, crystalline quartz assumes a uniform yellowish-brown or brownish-red colour when "rayed" by the rays of radio-active substances; the formation of coloured streaks and of patches similar to the markings of marble has also been observed. On the other hand, fused quartz generally assumes a uniform brownish-violet colour when exposed to radium rays.

In his work preparatory to the determination of the atomic weight of radium, Hönigschmid (*Wien. Ber.*, cxx., 1617, 1911) used fused quartz evaporating basins for recrystallising large quantities of radium chloride, and these afterwards showed a remarkable spiral coloration. Radiating from the centre of each basin was a series of spiral-shaped streaks of a dark violet colour, which continued in many cases almost to the top of the basin. Their upper extremity would undoubtedly be limited by the height to which the radium chloride solution had occupied the vessel. The space between the streaks showed little or no coloration. As is usual in such cases, the coloration disappeared on heating the dishes in a Bunsen flame, a brilliant bluish-violet luminescence being produced.

It has generally been assumed that the conditions in the quartz which give rise to these "streaks" are connected with the mode of manufacture of such vessels, and I believe the above colouring effects may be of interest in view of Lord Rayleigh's interesting observation of the "optical heterogeneity" of silica glass.
ROBERT W. LAWSON.

The Physics Laboratory,
Sheffield University,
October 31.

The Antiquity of Man.

IN the altogether excellent jubilee number of NATURE (No. 2610, vol. civ.) there is, I notice, a short paper entitled "The Antiquity of Man" contributed by Dr. A. Smith Woodward. We are told in this paper (p. 212) that "as discoveries progress it becomes increasingly clear that true man, of the family Hominidæ, *cannot* [the italics are mine] be earlier than Late Pliocene or the dawn of the Pleistocene." We learn also that "so long ago as 1880" Sir William Boyd Dawkins, "for other reasons," came to the same conclusion.

As your readers are doubtless aware, the question as to when man first appeared upon this planet has always been of what may be termed the "vexed" order, and generally regarded as unsettled.

But though it may be the opinion of Dr. Smith Woodward and of Sir William Boyd Dawkins that "true man" cannot be of a greater antiquity than "Late Pliocene or the dawn of the Pleistocene," it does not necessarily follow that such an opinion is correct. The chief evidence upon which the idea of the great antiquity of the human race is based—evidence not mentioned in Dr. Smith Woodward's article—is that afforded by the various implements of flint and other rocks which have been found embedded in certain Pliocene and Pleistocene strata. These humanly fashioned stones are comparatively numerous, and afford evidence of a more complete type than is provided by the "few fragments of apes and man" which have hitherto been recovered from ancient deposits.

In view also of certain discoveries made in Suffolk since 1909 (described by Sir Ray Lankester and by myself), and the results of the excavations carried out during the last twelve months in the Red Crag at Foxhall, near Ipswich, I would venture to regard it as highly probable that a type of man capable of flaking flints in a clearly dexterous manner was present in that part of the country not later than Middle Pliocene times, and possibly even earlier. Further, these discoveries have demonstrated that, as would be expected, these Mid-Pliocene individuals were preceded by an earlier race or races of people who fashioned their flints in a less skilful manner. But whether these ancient flint-flakers were "true" men or not I am quite unable to say. I should imagine, however, that, judging from the kind of implements found, they had attained to a status far above that of any known ape.

It is clear, then, that Dr. Smith Woodward's views, as expressed in the jubilee number of NATURE, upon the antiquity of man do not coincide with those of many of us who have made a study of early flint implements. Moreover, the fact that such widely divergent views upon this question are possible shows the urgent need for further research, especially as the present palæontological evidence, upon which Dr. Smith Woodward's opinions are founded, is, from its very nature, largely negative in character.

J. REID MOIR.

I THINK our present knowledge of the facts and principles of palæontology justifies the statement I made. I intentionally omitted all reference to chipped flints because I regard them as inconclusive evidence.

A. SMITH WOODWARD.

WESTERN TURKESTAN.

WESTERN TURKESTAN has been, for all practical purposes, a closed land ever since the final subjugation of the Turkomans by Skobeleff in 1880. Political conditions made it difficult for Europeans, and particularly for British, to travel in the province. It was reserved for the expedition organised in 1905 by an American, Mr. Pumpelly,[1] to make the first scientific exploration of the region between the Pamir and the Caspian. Since then little or no exploration has been carried out.

During 1918 and 1919 opportunities occurred of visiting Turkestan, unhindered by the old restrictions, and much valuable experience was gained by the members of the British forces which at one time and another penetrated the province. A voyage across the Caspian in March, 1919, took me to Turkestan to a point within eighty miles of the Oxus, near Charjui, and the unusual facilities of the journey enabled me to see much that would not have been very accessible under pre-war conditions.

Once the Caspian is crossed and the Caucasus left behind, one is in a region where the subjection of the routine of life to physical limitations is very marked. Krasnovodsk, the port of Western Turkestan, a cluster of drab houses on the foot of arid and treeless hills, lives solely on what the ships and the railways bring to it. The route to inland Turkestan passes south-east from the town, skirting the long arm of Balkhan Bay, and passing between a gap in the hills—a gap which, it is generally agreed by geologists, was more than once in historical times the passage through which the Aral and the Caspian were joined; the northern junction of these waters is believed by Kropotkin and others to have been round the north end of the Ust Urt Plateau into the bay of Mortvy Kulduk.

Once through this gap, the route runs nearly due east, and the plain of Kara Kum opens out to the north with the long *sierra* ridge of Kopet Dagh screening off Persia on the south. From Kizil Arvat to Askhabad, a distance of about 130 miles, the railway and caravan route to the east runs between the desert and the foothills. Numerous prehistoric mounds, mostly of the flat-topped variety, are found along the foothills and bear testimony to the antiquity of the route.

Except for occasional oases, the Kara Kum plain is a vast and continuous desert, almost entirely flat, and with camel-thorn as its only vegetation. But though now it is for the most part desert, the fertility of the oases, round which cotton- and corn-fields are abundant, suggests infinite possibilities, as the desert, at least between Kizil Arvat and New Merv, is of rich clay, and not of sand. Here and there a simple system of converging trenches leading down from the foothills has provided the irrigation the general absence of which is the chief obstacle to agriculture.

Russian rule, prior to the revolution, by encouraging and subsidising the growth on a large scale of cotton and cereals, had largely contributed to transforming the Tekke Turkomans into a sedentary and agricultural race. In place of the temporary camps of forty years ago, one now sees large villages, which comprise groups of two or more *Kibitkas*, enclosed in a mud wall. Sometimes even the *Kibitkas* are replaced by permanent single-storied flat-roofed houses of the Caucasian type—the whole resembling the type of walled farm common in Macedonia. Recent upheavals, however, have revived the nomadic spirit. The Tekke Turkomans, largely at the instigation of the Yomut Turkomans, who are in a less fertile area, have shown signs of a movement *en masse* to less troubled areas in the south.

Askhabad, situated well out on the plain, is in the most fertile region of all Western Turkestan. It serves as the chief internal commercial centre of the province, while Kizil Arvat is rather the clearing-house for exports and imports. Dried fruits, carpets, fish from the Caspian, and furs are always to be found in its large and prosperous market. Afghans from the south, Sarts from Bokhara, Persians from over Kopet Dagh, and even Greeks from Baku and Batum, make up, with the Tekkes and Yomuts, the cosmopolitan crowd typical of a market-place of the Middle East. Whether the produce of the little-known but prosperous seal fisheries of the North Caspian penetrate these regions I was unable to find out, but the museum at Askhabad contains a collection of interesting photographs and implements illustrating this industry.

The main trade connections of New Merv are with the East and South, and carpets and silks form the staple produce of the town. The town itself is on the banks of the Murghab river, which is here no inconsiderable stream, being on an average about 50 ft. in width and well protected with dykes.

Old Merv, the ancient Antiocheia, the mediæval "Queen of the Earth," is situated some twenty miles east of New Merv. It is a sombre and impressive ruin, covering about thirty square miles. The ancient walls of the citadel still stand, hardly damaged by the passage of time, close by the woods and fields of the model estate of the late Tsar at Bairam Ali. The prosperous nature of this estate is proof of what the soil of Turkestan is capable when dealt with scientifically.

Between Old Merv and the Oxus are only rolling sand-dunes, unproductive and desolate. The process of desiccation is still continuing in Western Turkestan, and the geological causes that have affected in so many and various fashions the course of history in these regions are still operative. The Oxus, which originally flowed due north to Aral, later changed its direction, running a south-westerly course into Lake Sarykamish and the Uzboi Channel of the old Aralo-Caspian Sea. Later it reverted to its original northern flow. The Aral has been alternately marsh and sea. The causes of these changes are still the ruling factors in a land where the human element is not active. The province, left to itself, is passing through another cycle in which a shrinkage of water supply is the most marked feature. In 1842 the Abougir Gulf of Lake Aral comprised 3500 square kilometres of water surface; to-day it is practically dry. The province is essentially an inland region dependent on adjacent mountains and lakes for its water. Methodical irrigation might yet reclaim much that in the near future will be absorbed into desert. S. CASSON.

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[1] See Pumpelly, "Explorations in Turkestan" (Published by the Carnegie Institution of Washington in 1905 and 1908.)

THE BRITISH ASSOCIATION AND SCIENTIFIC RESEARCH.

THE valuable work done for science by the research committees of the British Association is well known in the scientific world, but few people outside are familiar with its nature, extent, or influence. It is not commonly understood that all members of such committees render their services without fee of any kind, or even receive travelling expenses to attend meetings; indeed, as a general rule, a member not only gives his time and knowledge freely, but also adds somewhat to his personal expenditure. The association makes grants of a few pounds annually to some of the research committees, but others are without grants; and in many cases the chairmen and secretaries meet the necessary expenses out of their own pockets.

The committees thus represent at its highest and best united work for the promotion of natural knowledge, and their constitution could not well be improved. The subjects and members are put forward by the various sections of the association, and any grants desired have to pass the scrutiny of the Committee of Recommendations, which is made up of representatives of all the sections. The organisation is, in fact, one in which men of science themselves decide upon subjects of research, and allocate the slender funds at their disposal to aid selected inquiries and reports. Obviously, this system is both efficient and economical, and its general adoption would be in the best interests of progressive knowledge.

The amount of money which the association can allocate as grants in aid is, however, only about 1000*l*. per annum, and this has to be shared between thirty or more research committees. As other funds are now available for scientific research, it has been suggested that the association should limit its aid to committees to the payment of secretarial and like expenses, instead of attempting to provide for actual investigations by the small grants it is able to afford.

The work of the research committees has, however, been of such high value throughout the existence of the association that no one would wish to make any change which would diminish its importance; and there is not the slightest doubt that whatever funds the association has available for research will be usefully applied. The present position is clearly stated in the subjoined communication from Prof. John Perry, treasurer of the association, being mainly remarks made by him before an evening discourse on September 11 at the recent Bournemouth meeting of the association. No general appeal is made for funds, but it is to be hoped that wealthy benefactors will follow the example of Sir James Caird and others interested in the promotion of scientific knowledge, for no more effective machinery for attaining this end could be devised than that provided by the British Association committees.

"You are aware that, after paying printing and office expenses, the funds of the British Association are devoted to scientific research. For more than eighty years we have spent more than 1000*l*. a year on research, long before ordinary people had heard of research.

"Every year we form many research committees; each of them is formed of the foremost men of science of Great Britain, who receive none of the money themselves, and their accounts for mere out-of-pocket expenses are carefully audited. These researches in the past have created some entirely new sciences, have led directly and indirectly to the creation of many new industries, and they have largely produced the world's present natural knowledge. And now to my point. Yesterday a very prominent member of the association asked me about our finances. I had to admit that even before the war we were meeting with difficulties due to the increased cost of printing and other things, that since the war we have been behindhand to the extent of more than 1000*l*. every year, and that we have never yet asked for the help of moneyed men. The only gift we have ever received from a moneyed man was a voluntary gift from Sir James Caird, who handed me 11,000*l*. at the Dundee meeting. My questioner said we ought to ask for help, and that he was willing to start a fund with a sum of 1000*l*. At this moment he does not wish to have his name mentioned.

"I need not dwell on the importance of our research work, as I feel sure that every person here who has himself done original work shares my opinion that when we limit our expenditure on research, and especially on pure scientific research, we shall begin to be a bankrupt association—bankrupt, that is, morally from the point of view of science, if not actually in the financial sense.

"The moneyed men of Great Britain are most willing to help any good object when they get proof that it really is a good object. We cannot complain of want of their help, for they did not know the facts. At the same time, the treasurer of an association with such a record as ours does not feel happy at the prospect of begging for help."

In the two days of the meeting following that on which I made this statement, the fund was raised to a total of 1475*l*. I intend to publish in due course a list of names of donors and donations.

To illustrate by many instances (as I might) our claims as to the importance of our researches would unduly prolong this letter, and any selection of a few examples would be unrepresentative. I will cite a single illustration:—The National Physical Laboratory, the scene of researches of which the importance to the nation during the war and earlier cannot be overestimated, had its origin (if its antecedents be traced backward) in the Kew Observatory, which was maintained by the British Association from 1842 to 1872, in which period the association spent some 12,000*l*. on its upkeep.

DR. JOHN AITKEN, F.R.S.

DR. JOHN AITKEN, widely known for his unique researches in meteorology, died at Ardenlea, Falkirk, on Friday, November 14, at the ripe age of eighty years. Although he served his apprenticeship as a marine engineer, Dr. Aitken's intellectual interests drew him into the fields of